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Explore Celestial Vistas Off the Beaten Path

Let's take a deep dive into the wondrous treasures of Vulpecula, Sagitta, Delphinus, and Equuleus.

The Northern Hemisphere summer Milky Way offers countless spectacular targets for stargazers, especially in the prominent constellations Cygnus, Aquila, and Sagittarius. But smaller constellations hold plenty of appealing sights, too. In this tour, we follow a scenic celestial side road that runs in a 35° arc from Albireo in Cygnus to Enif in Pegasus through the tiny constellations Vulpecula, Sagitta, Delphinus, and Equuleus. Here we'll find a satisfying assortment of star clusters, nebulae, and double stars to examine with a small telescope or binoculars on a warm summer night.

Into the Fox's Den

Let's begin in Vulpecula, the Fox. Polish astronomer and cartographer Johannes Hevelius conceived this constellation,

and his wife, Elisabetha Koopman, herself an accomplished astronomer, featured it in an atlas published a few years after his death in 1687. I struggle to see a fox here, and from the suburbs I have difficulty seeing anything at all, since the constellation contains no stars brighter than 4th magnitude. But even modest optics will reveal the first stop on our tour: **Brocchi's Cluster**, also known as the Coathanger for its distinctive shape. Cataloged formally as Collinder 399, this asterism appears to the naked eye as a fuzzy patch about 8°

▲ **HOURGLASS IN THE SKY** M27, the Dumbbell Nebula, is one of the finest planetary nebulae in the sky. It appears almost rectangular through small telescopes at low magnification. Larger scopes will start to reveal its classic hourglass or apple-core shape and faint extensions on each side. Unless otherwise noted, north is up in all images.

south-southwest of Albireo, Beta (β) Cygni. My 12×36 binoculars resolved the group into a straight line of six stars of magnitudes 5 to 7, spanning about 1.5° east-west, with four more stars forming a trapezoidal “hook” to the south. In my 85-mm refractor at 25× with a 2.7° field of view, I saw most of the stars as blue-white, save for an orange and a yellow star near the tip of the hook.

About 18′ east of 7 Vulpeculae, the easternmost star at the Coathanger’s base, we find the open cluster **NGC 6802**. I easily saw its unresolved haze in my 85-mm refractor at 46× under dark sky. Just 5′ across, this 8.8-magnitude cluster profits from aperture and magnification. I partially resolved its tightly packed stars with my 10-inch Dobsonian reflector at 92×, and it appeared clearly rectangular, with its long axis oriented north-south. At a considerable distance of 3,700 light-years, this lovely cluster is dimmed and yellowed by the relatively thick dust in the plane of the Milky Way.

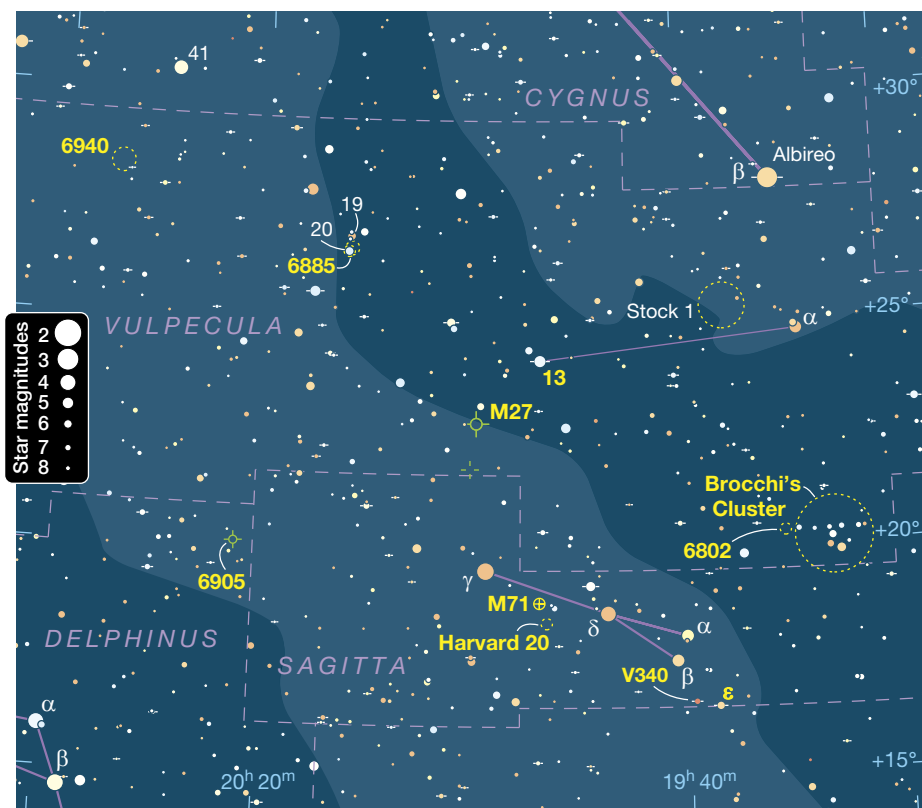
Now let’s move on to **M27**, the Dumbbell Nebula, the showpiece of Vulpecula and one of the most magnificent objects in Charles Messier’s catalog. It lies 3.2° north of Gamma (γ) Sagittae.

I first observed this hourglass-shaped planetary nebula as a youngster with a ramshackle 3-inch Tasco reflector, and it remains a favorite of mine. Arguably the finest of its class for visual observers, M27 shines at magnitude 7.1 and spans 8′ × 6′, enormous for a planetary. Its size is a consequence of its proximity (1,360 light-years) and age (about 9,000 to 14,000 years), which has given its gaseous envelope time to expand. M27 shows well in nearly any instrument. I saw hints of its telltale shape in 12×36 binoculars, while my 85-mm refractor at 75× and an ultra-high-contrast (UHC) filter revealed its pale-green hue and prominent end caps, as well as a bright diagonal bar running east-northeast to west-southwest. In my 10-inch at 92×, I detected traces of bright, knotty structure in the southwestern lobe along with foreground and background stars. A lovely star field envelopes the whole structure. The Dumbbell’s central star, now emerging as a hot white dwarf, shines at 14th magnitude and lies beyond the reach of my 10-inch from my site.

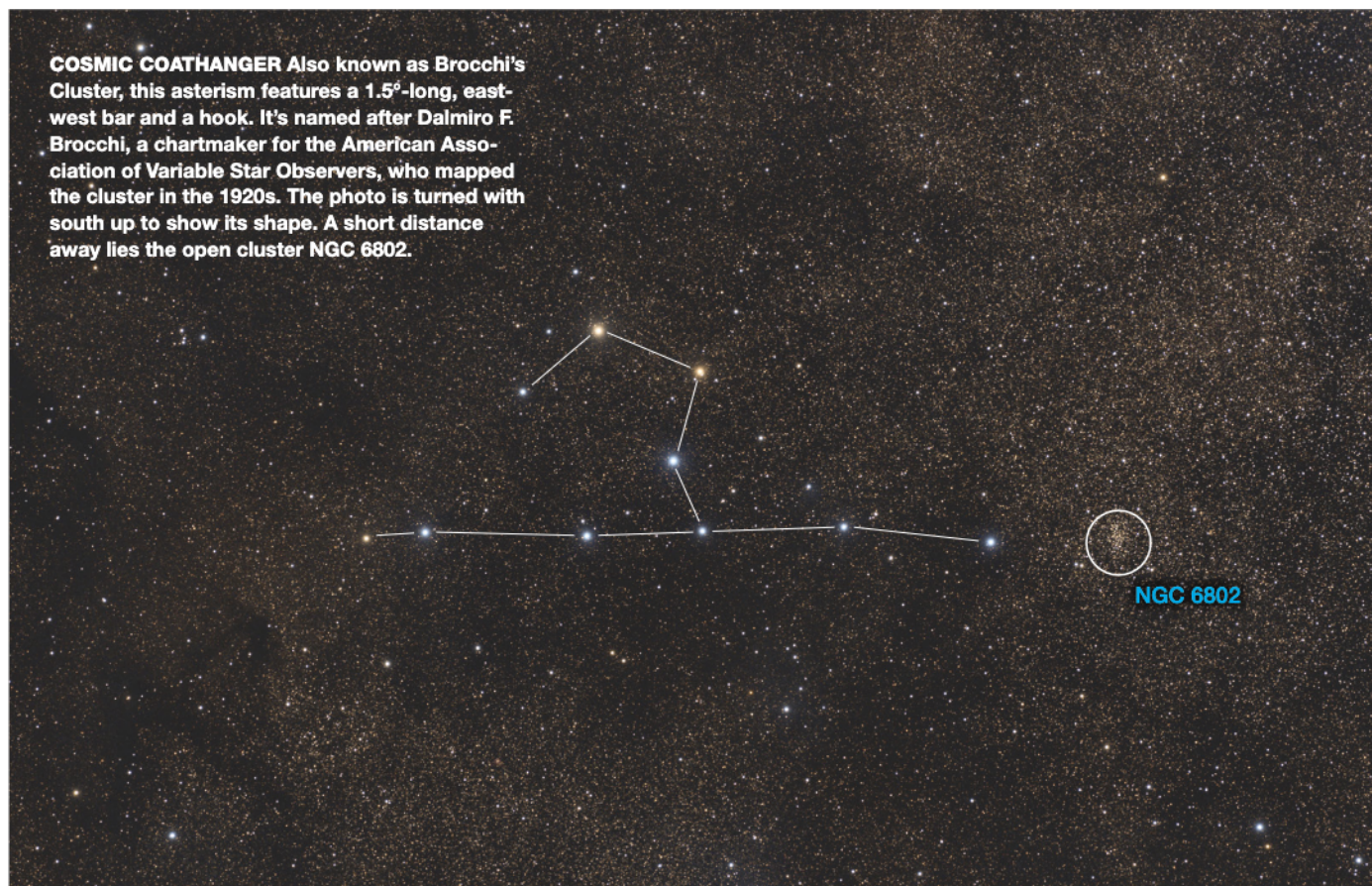
Some 4.7° northeast of M27 lies the open cluster **NGC 6885**, anchored by the 6th-magnitude star 20 Vulpeculae. It spans about 18′ in diameter. In my

85-mm refractor at 46×, I saw three dozen or so 9th- to 12th-magnitude stars, most in a band running east to west with 20 Vulpeculae at its southern boundary. A few more scattered stars lie to the south of this irregular but attractive 8th-magnitude cluster. Across an ill-defined gap to the cluster’s north lies the sparse NGC 6882, a putative open cluster dominated by three stars, including the 5.5-magnitude yellow-orange star 19 Vulpeculae. Both clusters framed nicely in a rich background at 75× in the 1.3° field of my 85-mm scope and 8-mm Ethos eyepiece. According to astronomy historian Harold Corwin, NGC 6882 is most likely a duplicate observation of NGC 6885, due to a positional error made by William Herschel when he discovered them in 1784.

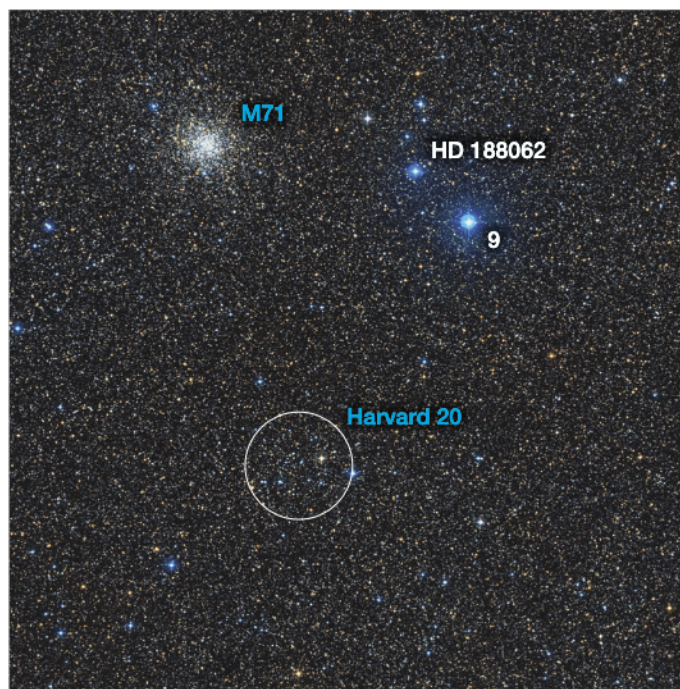
Now turn your telescope to the northeastern corner of Vulpecula, about 6.2° south-southwest of the star Epsilon (ε) Cygni near the southern wingtip of the Swan. Here lies the splendid but sometimes overlooked open star cluster **NGC 6940**. At magnitude 6.3 and 31′ in size, this beautiful aggregation lies only 2½° southeast of 4.0-magnitude 41 Cygni. In a telescope in dark sky, the cluster assumes the classic diamond-dust countenance that makes such objects appealing targets for visual observers. Even the finest astrophotos can’t capture their appeal. In my 85-mm refractor at 75×, I saw perhaps 50 members from magnitude 11 down to my limit of visibility, along with red-orange FG Vulpeculae, a 9th-magnitude variable star near its center. The cluster appears uniform, slightly elliptical, and centrally compressed, with many outlying stellar assemblies of loops and chains. With some 170 members, NGC 6940



► **CELESTIAL FOX AND ARROW** Use this finder chart to plan the itinerary of your star-hopping. Unlike Sagitta, the Arrow, the stars of Vulpecula, the Fox, are relatively indistinct — use Albireo, Beta (β) Cygni, as a jumping-off point.



COSMIC COATHANGER Also known as Brocchi's Cluster, this asterism features a 1.5°-long, east-west bar and a hook. It's named after Dalmiro F. Brocchi, a chartmaker for the American Association of Variable Star Observers, who mapped the cluster in the 1920s. The photo is turned with south up to show its shape. A short distance away lies the open cluster NGC 6802.



▲ **A TALE OF TWO CLUSTERS** Use 6.2-magnitude 9 Sagittae and 7.7-magnitude HD 188062 as guideposts in locating the globular cluster M71 amid the rich Milky Way star field. About 30' to its south-southwest is the loose, dim open cluster Harvard 20, the twentieth object listed in Harvard Observatory's 1930 catalog of star clusters.

contains sufficient mass to remain largely intact after a billion years of gravitational tugging and pulling by passing interstellar gas clouds.

Before we leave Vulpecula, let's power up and try to resolve the tight double star **13 Vulpeculae**. With components of magnitudes 4.6 and 7.4 separated by 1.5", this physical double presented a challenge in my 102-mm f/11 ED refractor, even at 250× on nights of anything but rock-steady seeing. But when the air stabilized, I split it cleanly and saw the blue-white color of the primary and — with less certainty — a tinge of yellow-orange in the secondary.

Straight to the Arrow

We now journey southward along our celestial back road into the little constellation Sagitta, the Arrow. Claudius Ptolemy included Sagitta as one of the 48 constellations in his 2nd-century *Almagest*, and it's the third-smallest constellation by area, after Crux (the Southern Cross) and Equuleus (the Little Horse). The arrangement of Sagitta's brightest stars clearly resembles its name. Some ancient Greek legends feature Sagitta as the arrow Hercules used to kill Aquila, an eagle sent by Zeus to perpetually gnaw on the liver of Prometheus.

Sagitta sits in the plush star fields just off the summer Milky Way, making it ideal for sweeping aimlessly with a rich-field telescope for small star clouds and scattered patches of dark nebulae. Its showpiece is another personal favorite of

mine, the globular cluster **M71**. It lies in a spectacular field halfway between Gamma and Delta (δ) Sagittae, 15' east of a curious, Y-shaped asterism that resembles a mini-Sagitta, of which 6th-magnitude 9 Sagittae is the base. This small, loose globular spans about 7.2'. It appeared tiny, largely uniform, and partially resolved in my 85-mm refractor at 75 $\times$, with a hint of angularity to the southwest. My 10-inch at 150 $\times$ resolved this 8th-magnitude cluster to the core and yielded a striking view of what appears to be a dense and slightly irregular open cluster rather than a globular. Astronomers have long debated whether M71 is an open cluster, but detailed photometric inspection confirms it's a globular with an unusually young age of 9 to 10 billion years.

While you're here, look 30' south-southwest of M71 to see the sparse, scattered cluster **Harvard 20** spread over 8'. At magnitude 7.7, the cluster outshines M71 but is harder to discern against the starry background. With my 10-inch, I saw about 20 to 30 stars in a vaguely triangular shape. This indistinct cluster, along with M71 and the Y-shaped asterism, fits into a 1° field of view.

Now let's inspect the lovely double star **V340 Sagittae**, nearly 1° south-southwest of Beta Sagittae. The pair consists of a 6.4-magnitude red-orange primary and a 9.5-magnitude

blue-white secondary separated by 28". They were an easy split in my 85-mm scope with a 24-mm Panoptic eyepiece at 25 $\times$. To me, the primary looked ochre, while the secondary glowed a pale turquoise.

In the same field 31' to the west, I saw another double star, **Epsilon Sagittae**. It featured a pale-yellow, 5.8-magnitude primary and an 8.4-magnitude secondary separated by 88".

Dive into Delphinus

Shifting farther east, we arrive at Delphinus, the Dolphin. Its five brightest stars do resemble a little dolphin that spans about 6° from nose to tail. Four of the stars — Alpha (α) Delphini, Beta Delphini, Gamma Delphini, and Delta Delphini — form a diamond-shaped asterism known as Job's Coffin.

At the northwestern edge of Delphinus, near the border with Sagitta and Vulpecula and 6° northwest of Alpha Delphini, lies the lovely planetary nebula **NGC 6905**, nicknamed the Blue Flash. While dim overall at magnitude 10.9, it has sufficient surface brightness to punch through my light-polluted suburban skies. I easily spotted it with my 10-inch at 46 $\times$, appearing slightly extended and surrounded by a little triangle of 10th- to 12th-magnitude stars. The gray-green nebula is hemmed in by the triangle's two western

A Plethora of Summer Delights

Object	Type	Constellation	Mag	Size/Sep.	RA	Dec.
Brocchi's Cluster	Open cluster	Vulpecula	3.6	90'	19 ^h 26.2 ^m	+20° 06'
NGC 6802	Open cluster	Vulpecula	8.8	3'	19 ^h 30.6 ^m	+20° 16'
M27	Planetary Nebula	Vulpecula	7.1	8' $\times$ 6'	19 ^h 59.6 ^m	+22° 43'
NGC 6885	Open cluster	Vulpecula	8.1	18'	20 ^h 12.0 ^m	+26° 29'
NGC 6940	Open cluster	Vulpecula	6.3	31'	20 ^h 34.5 ^m	+28° 17'
13 Vulpeculae	Double star	Vulpecula	4.6, 7.4	1.5"	19 ^h 53.5 ^m	+24° 05'
M71	Globular cluster	Sagitta	8.1	7.2'	19 ^h 53.8 ^m	+18° 47'
Harvard 20	Open cluster	Sagitta	7.7	8'	19 ^h 53.2 ^m	+18° 21'
V340 Sagittae	Double star	Sagitta	6.4, 9.5	28"	19 ^h 39.4 ^m	+16° 34'
ϵ Sagittae	Double star	Sagitta	5.8, 8.4	88"	19 ^h 37.3 ^m	+16° 28'
NGC 6905	Planetary nebula	Delphinus	10.9	47" $\times$ 37"	20 ^h 22.4 ^m	+20° 06'
NGC 6891	Planetary nebula	Delphinus	10.4	15"	20 ^h 15.2 ^m	+12° 42'
NGC 6934	Globular cluster	Delphinus	8.9	7.1'	20 ^h 34.2 ^m	+07° 24'
NGC 7006	Globular cluster	Delphinus	10.6	2.8'	21 ^h 01.5 ^m	+16° 11'
γ Delphini	Double star	Delphinus	4.4, 5.0	8.8"	20 ^h 46.7 ^m	+16° 07'
Σ 2725	Double star	Delphinus	7.5, 8.2	6.2"	20 ^h 46.2 ^m	+15° 54'
Σ 2735	Double star	Delphinus	6.5, 7.5	2.0"	20 ^h 55.7 ^m	+04° 32'
γ Equ, 6 Equ	Double star	Equuleus	4.7, 6.1	338"	21 ^h 11.6 ^m	+10° 14'
ϵ Equulei	Double star	Equuleus	5.3, 7.1	10.6"	20 ^h 59.0 ^m	+04° 18'
Σ 2742	Double star	Equuleus	7.4, 7.6	3.0"	21 ^h 02.2 ^m	+07° 11'

Angular sizes and separations are from recent catalogs. Visually, an object's size is often smaller than the cataloged value and varies according to the aperture and magnification of the viewing instrument. Right ascension and declination are for equinox 2000.0. Magnitudes are visual.

stars. With a disk spanning $47'' \times 37''$, it took magnification well. A UHC filter at $180\times$ showed the disk distinctly separated from the two stars along with barely perceptible hints of mottling in the nebula's interior. But it had far less structure than I saw in M97, the Owl Nebula in Ursa Major, to which NGC 6905 is sometimes compared. I saw no blue with my 10-inch scope, but I did see a "flash" of sorts when I averted my vision intermittently to optimize visual sensitivity.

Western Delphinus harbors another fine planetary, **NGC 6891**, about $4\frac{1}{2}^\circ$ west-northwest of Epsilon Delphini. The nebula appeared smaller and brighter than the Blue Flash, which made it easier to distinguish from the background stars at low magnification with a UHC filter. With my 10-inch at $92\times$ and a 1° field, I saw the starlike nebula at the southern end of a line of five stars $\frac{1}{2}^\circ$ long, running north-south. At $150\times$ it showed a tiny, featureless disk, and at $260\times$ I saw hints of a bright halo around the disk. Unlike the Dumbbell Nebula, NGC 6891 easily revealed its central, 12.5-magnitude star in my 10-inch. Images from professional telescopes show that

▼ **SWIM WITH THE DOLPHIN** The tiny constellation Delphinus is an easy-to-spot pattern of mostly 4th-magnitude stars. Despite its diminutive size, Delphinus resides in an area of the sky rife with deep-sky splendors.

the nebula has several distinct shells, each expanding at different speeds, produced by separate outbursts from the dying central star over the last 28,000 years.

Now let's examine a pair of distant globular clusters, starting with **NGC 6934**, a tightly packed stellar spheroid about 52,000 light-years away. With a diameter of $7'$, this 8.8-magnitude cluster sits about 4° directly south of Epsilon Delphini (the tip of the dolphin's tail) and only $2'$ east of a 9th-magnitude star. This dense stellar grouping features a number of *blue stragglers* — massive stars that burn faster, hotter, and bluer after the collision and merger of two smaller stars. They lie beyond the reach of a typical backyard telescope. In my 10-inch at any magnification, I saw nothing but a grainy outer halo of stars surrounding an impenetrable core. Even large, ground-based telescopes struggled to fully resolve the cluster's core until 1999, when the 8.1-meter Gemini North telescope on Mauna Kea cracked it using an adaptive optics system.

Smaller and dimmer still, the globular cluster **NGC 7006** lies some 135,000 light-years away, far out in the halo of the Milky Way. You can spot it 3.6° east of Gamma Delphini, the dolphin's snout. Glowing at magnitude 10.6 and with a diameter of $2.8'$, the cluster was a dim smudge in my 85-mm

refractor. My 10-inch offered a little graininess in its outer reaches along with a distinct but unresolved core. The cluster appeared slightly elongated east-west. While not much to look at, NGC 7006 is one of the most distant of the Milky Way's globulars and, along with NGC 6934, moves through the galactic halo in a highly elliptical orbit.

Now let's examine the superb Delphinus double-double: **Gamma Delphini** and Struve 2725 (**$\Sigma 2725$**). Gamma features a golden, 4.4-magnitude primary separated by $8.8''$ from a blue-white, 5.0-magnitude secondary. I easily split the components in my 102-mm refractor at $125\times$ with an eyepiece that offers a $\frac{1}{2}^\circ$ field of view. Some $14'$ to the south-southeast, $\Sigma 2725$ appears like Gamma Delphini's pale reflection. Its yellow components shine at magnitudes 7.5 and 8.2, with a $6.2''$ gap. While both Gamma Delphini and $\Sigma 2725$ are themselves physical doubles, the pair is not physically related.

The more challenging binary star **$\Sigma 2735$** sits in the southeastern corner of Delphinus. This pair of distant suns of magnitudes 6.5 and 7.5 are separated by $2.0''$. I split them easily under good seeing through my 102-mm refractor at $125\times$. The primary appeared canary yellow, while the secondary looked white.

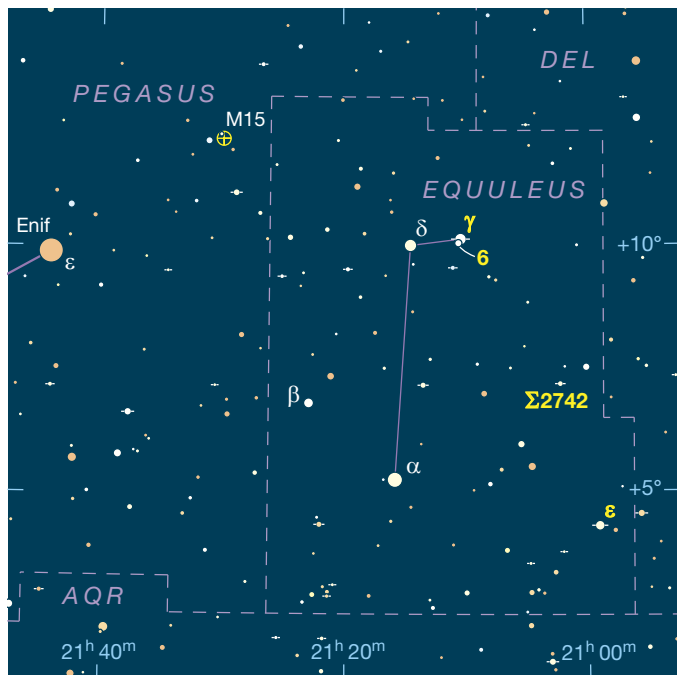




▲ **MULTI-SHELLED PLANETARY** NGC 6891 exhibits a complex, asymmetrical structure, as revealed in this Hubble Space Telescope image. It features a dim, outer spherical halo surrounding a bright, inner core with at least two overlapping oval shells at different orientations. They indicate a series of outbursts from the 12th-magnitude central white dwarf star.

Galloping to Equuleus

Now let's jump over the fence of Delphinus to take in Equuleus, the Little Horse. This indistinct group was perhaps invented by Hipparchus in the 2nd century BC and included in Ptolemy's 48 constellations. In some Greek legends, its stars represent Celeris, a swift colt and the brother of Pegasus, the Winged Horse, although it takes a feat of imagi-



▲ **MAGNIFICENT DISTANT GLOBULAR** Lying about 52,000 light-years from Earth, 9th-magnitude NGC 6934, also known as Caldwell 47, was discovered by William Herschel in 1785. Globular clusters are large, spherical concentrations of ancient stars, typically numbering a few hundred thousand, residing on the outer fringes of galaxies.

nation to see the shape of a little horse here.

As befits a constellation off the galactic plane, Equuleus contains many faint galaxies, too faint for my modest telescopes, but it also has a few interesting double stars. **Gamma Equulei** (magnitude 4.7) and **6 Equulei** (magnitude 6.1) form a wide binocular pair separated by 6'. I saw the two with plenty of sky between them in 12×36 binoculars. But I needed a telescope to split another double star, **Epsilon Equulei**, which consists of 5.3- and 7.1-magnitude components separated by 10.6". They split easily in my 102-mm refractor at 47×. Boosting magnification to 125× increased the space between the yellow primary and blue-white secondary. Finally, the tidy double **Σ2742** features two solar-type stars of magnitude 7.4 and 7.6, split by 3.0". They looked balanced and stately with their matching diffraction patterns in my 102-mm scope at 170×.

We're getting too far east now, nearly into Pegasus and the realm of galaxies, so it's time to end our ride down this celestial side road. While they may resemble characters in an illustrated children's book, the fanciful constellations of the Fox, the Arrow, the Dolphin, and the Little Horse offer us plenty to see and to return to during the slowly lengthening summer nights.

■ Contributing Editor **BRIAN VENTRUDO** enjoys surfing the Milky Way with wide-field telescopes from his home near Calgary, Canada (see his website **CosmicPursuits.com**).

◀ **EQUINE ADVENTURE** You can use Enif, Epsilon (ε) Pegasi, the 2.4-magnitude star marking the nose of Pegasus, the Winged Horse, as your starting point in exploring the domain of Equuleus, the Little Horse.